

August 27, 2014

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Ms. Jean A. Mescher, Project Coordinator
Director, Environmental Services
McKesson Corporation
One Post Street, 34th Floor
San Francisco, CA 94104

Subject: Revised Conceptual Site Model and Proposed Decision Unit Plan for the Arkwood, Inc. Site, Omaha, Arkansas; EPA ID# ARD084930148; Site ID: 0600124

Dear Ms. Mescher:

This letter report provides a proposed conceptual site model (CSM) for the Arkwood, Inc. site ("Site") in Omaha, Arkansas. The CSM addresses polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/Fs) to evaluate risk assessment compliance of the remediated Site given recent changes in the toxicity criteria for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) (IRIS, 2012; USEPA, 2009). A summary of 1995 post-excavation sampling data and 2012 sampling data is presented and utilized to develop "decision units" (DUs) for the Site. In addition, we have proposed an approach for further soil sample collection to confirm PCDD/Fs concentrations for the decision units. The USEPA (2011) guidance for incremental composite soil sampling for PCDD/Fs was utilized to develop a set of 7 areas that will be designated as separate DUs, each of which will be sampled using the incremental sampling methodology (ISM) and 1 – 10 composite samples of 30 to 40 increments will be collected from each DU, depending on its size and the expected heterogeneity of the PCDD/F concentrations in the DU. These composite samples will be considered the representative soil concentration for each DU and will be used to evaluate risk assessment compliance for PCDD/Fs at the Arkwood, Inc. Site by comparing the maximum composite measurement for each DU to the dioxin soil screening level of 730 ppt TEQ.

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Conceptual Site Model Information

According to USEPA (2011) guidance, a CSM pertaining to PCDD/F soil concentrations at the Arkwood Inc. Site should contain appropriate historical information regarding the past activities and information relevant to sources, transport pathways, and completed exposure routes that may be relevant to current and future site operation and use conditions. Accordingly, in the attached figures and tables we have provided the information which characterizes the relevant parameters based on available documents and data resources. The site history information is contained in the EPA online information for the Site and was used to develop the CSM. The post-excavation sampling data and site characteristics that define potential soil exposure routes for risk assessment purposes are presented in this report.

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Topographic maps were obtained from USGS/Google Maps identifying the steep terrain surrounding the Arkwood Inc. Site, which was a plateau carved out from adjacent hillsides surrounding most of the site perimeter. Figure 1 identifies the perimeter of the site in reference to the topographic features. Figure 2 illustrates that the plateau comprising the Site is bordered by contiguous uphill gradients on approximately three quarters of the site perimeter. Only on the northwestern section of the site perimeter is there a downhill gradient that descends approximately 12-15 feet down to a flat area adjacent to the railroad tracks; this ditch area gradually slopes towards the railroad tunnel in an easterly direction. A bird's eye aerial photograph taken at the western edge (main entrance) of the site in Figure 3 illustrates that the plateau of the site gradually slopes towards the entrance at an approximate grade of 5 to 10 degrees that promotes sheet flow of rainwater across the vegetated main Site. In 1994, prior to any remedial work at the Site, the stormwater drainage ditches were constructed along the perimeter of this section of the site near the current fenceline of the facility. The fenceline is at the top of the slope that descends toward the railroad ditch area at an approximate grade of 45-60 degrees. The surface water flow during rain events drains towards the Site entrance and is intercepted by the stormwater ditches on the north, south and west edges of the Site. The two onsite drainage ditches meet at the natural berm area beside the main entrance road just beyond the confluence of the main road and the former haul road that turns off to the right (south). This Site configuration provides for percolation of rainwater within the stormwater ditches except in extreme rain events when overflow of the ditches can lead to excess stormwater release at the natural berm area that flows down to the adjacent railroad ditch area.

Figure 4 provides an overview of the former excavated zones (within the black outlines) and the areas of the Site that were subsequently graded and capped (within the blue outlines). The capped zone extends over approximately 82% of the Site surface area and completely covers the formerly excavated zones up to the building foundation and up to the drainage ditches (Figure 4). Notably, the eastern-most area of the site was not used for storage or processing of treated wood and thus may be considered a background zone. Likewise, the western-most triangular area at the main entrance was not used for storage or processing of treated wood. However, the remainder of the Site was graded and covered with a 6-inch clean cap per the USEPA-approved remedial design in 1995.

Table 1 provides a summary of post-excavation confirmation soil sampling for PCDD/Fs conducted at the Arkwood Inc. Site in 1995 prior to final grading and installation of a 6-inch clean soil cap. These data are overlaid on the Google Map photo of the Site in Figure 5, showing the location and concentration ranges reported in 1995 as TCDD Toxicity Equivalents (TEQ) using the concurrent International- TCDD Toxicity Equivalence Factors (I-TEF) approach. Table 1 illustrates that based on ditch soil PCDD/F samples obtained in 2012, the I-TEF approach overstates the most current EPA-endorsed approach by the World Health Organization (WHO 2005 as adopted by USEPA, 2010) by an average factor of 1.28. The post-excavation sampling data expressed in the current TEF scheme indicates an average TEQ concentration of 5.85 ± 3.77 ppb (mean/SD) beneath the capped soil zone based on 37 composited samples from the excavation zones. The cap soil was obtained from a reportedly clean site excavation from Harrison, AR, but no soil PCDD/F measurements of this material were found in the available records. We understand that the stormwater drainage ditches surrounding the formerly operating portions of the Site were installed in 1994, prior to any excavation, grading and capping of the Site. The 6-inch cap soil does extend to the edge of the ditches onsite.

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Figure 6 provides a summary diagram of the CSM for risk assessment purposes, assuming industrial use in the future for the Site, the adjacent railroad ditch area, and New Cricket Spring. PCDD/Fs in soil from the areas affected by former processing and/or storage of treated wood materials are considered the main source, although some residual contamination in the drainage ditches and uncapped areas may have been deposited prior to or during the Site closure activities in 1995. The capped area is not expected to be subject to any substantial current or future PCDD/F contamination based on the origin of the soil used for capping and the cap performance since installation. Based on the current Site configuration, the only offsite transport pathways would include stormwater and associated sediment flowing into the onsite drainage ditches or down to the railroad ditch during exceptionally heavy rain events. All stormwater draining from the capped areas of the site is captured by the drainage ditch system, and there has been no history of erosion events or other ditch or cap failure. Accordingly, sediment PCDD/F transport creates a plausible completed exposure pathway for both onsite industrial workers and, for offsite trespassers, contacting the railroad ditch area. The direct soil exposure pathways for PCDD/Fs onsite and offsite include incidental soil ingestion and dermal contact.

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The inhalation pathway is included but it is considered negligible relative to the direct soil ingestion and dermal contact pathways since the contaminated areas of the Site have been capped and fully vegetated; therefore, appreciable dust release is not plausible (Paustenbach et al. 2006). The surface water pathway is excluded since there is no seasonal or permanent body of water onsite or in the railroad ditch area. Likewise, the groundwater transport pathway, while included, is considered incomplete due to the insoluble nature of PCDD/Fs and the sedimentation/filtration effects of the karst geologic structure underlying the Site. Finally, there are no plausible future residential uses of the Site in accordance with the ROD and deed restriction and the Site uses do not disturb the integrity of the Site cap and drainage systems.

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In addition, the open ditch sections adjacent to the roadway (limited to approximately 10 feet near the treatment system discharge and about 5 feet immediately before and after the discharge crosses beneath the Old Cricket Road) will be converted to a solid, covered culvert. Fencing will be installed around the detention pond property to limit access to this area. A deed restriction will be recorded to restrict the property to non-residential use. It is anticipated that these actions will resolve concerns regarding the areas near the water treatment plant being considered possible direct ditch soil contact and/or residential land use for risk assessment purposes.

Proposed Decision Unit Plan

Figure 7 provides an overview of seven proposed areas corresponding to “decision units” (DUs) at this Site in accordance with USEPA (2011) guidance. Table 2 presents a summary of each DU, its surface area, the expected level of PCDD/F concentration heterogeneity, the number of incremental samples to be collected, and overview of the sampling approach for each DU. All of the proposed samples will be surface soil samples collected from 0-~~6~~ inches in depth.

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DU #1 (Uncapped Area East) is the uncapped eastern section of the site where no treated wood storage or processing activities were conducted based on available information and is shown in detail in Figure 8. Because this DU is approximately 1.2 acres in area, it will be divided into 5 sampling units (SU) of 0.25 acres each. ~~Three~~ of the SU will be randomly selected and an incremental sample of 30 increments will be collected from each selected SU. The heterogeneity in PCDD/F concentrations is expected to be low to moderate in this area due to the lack of past site activity.

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DU #2 (Capped Area) is the capped area of the site that covers all of the formerly excavated areas; this will determine if there is any evidence of cap contamination that occurred during cap installation or due to cap breach after installation in 1995. This DU is shown in detail in Figure 9. This DU is the largest DU covering 82% of the site with an area of 11 acres. Because of its size, this DU will be divided into 44 SU of 0.25 acres each and ~~eight~~ SU of the 44 will be randomly selected for sampling. A single incremental sample of 30 increments will be collected from each of ~~seven~~ of the selected SU while three incremental samples of 30 increments each will be collected from one of the selected SU. The heterogeneity in PCDD/F concentrations in this area is expected to be low given that the soil will be from the clean cap.

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Figure 10 illustrates DUs #3 (Stormwater Ditch North) and #4 (Stormwater Ditch South). DU #3 is the northern perimeter ditch area spanning from the natural berm area on the western side of the Site to the northeastern-most perimeter adjacent to a formerly excavated and capped area. This DU is approximately 0.14 acres in area and 467 m in length. This DU will be divided in half lengthwise into two SU of approximately 233 m. One incremental sample of 40 increments will be collected from each SU. The increments will be collected from the bottom of the ditch approximately every 6 m along the length of the DU. DU #4 is the southern perimeter ditch area that also spans from the natural berm area on the western side of the Site to the southeastern-most perimeter adjacent to a formerly excavated and capped area. This DU is approximately 0.17 acres in area and 560 m in length. This DU will be divided in half lengthwise into two SU of approximately 280 m. One incremental sample of 40 increments will be collected from each SU. The increments will be collected ~~from~~ the bottom of the ditch approximately every 7 m along the length of the DU.

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DU #5 (Berm Area) is the sedimentation zone and basin (natural berm area) formed by the confluence of the north and south perimeter ditches; this is the area where 2012 ditch sampling events (independent samples, not composites) revealed soil concentrations of 328 ppt and 1,600 ppt TEQ. This DU is shown in Figure 11. This DU is bounded to the north by the fenceline and to the south by the road. The western boundary of the DU is set 10 ft from the location of the 1,600 ppt TEQ sample and the eastern boundary is set 50 ft from the same sample. The area of this DU is approximately 12 ft x 60 ft (0.02 acres). ~~Three~~ incremental samples of 30 increments will be collected from this DU with the increments being collected

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Table 1. Summary of 1995 and 2012 PCDD/F Sampling Results for the Arkwood Site.

Sampling Event	Sample ID	Cells Included In Composites ^a	I-TEF TCDD TEQ Concentration (ppb)	WHO 2005 TCDD TEQ Concentration (ppb)
1995	Cell 1	Cells 1, 9, 10, 11	8.5	6.65
1995	Cell 2	Cells 2, 3, 4, 5, 6, 7	4.7	3.70
1995	Cell 2	NA	8.8	6.86
1995	Cell 3	Cells 2, 3, 4, 5, 6, 7	4.7	3.70
1995	Cell 3	NA	10.2	7.92
1995	Cell 4	Cells 2, 3, 4, 5, 6, 7	4.7	3.70
1995	Cell 4	NA	12.9	10.02
1995	Cell 5	Cells 2, 3, 4, 5, 6, 7	4.7	3.70
1995	Cell 5	Cells 5, 6, 7	11.8	9.20
1995	Cell 6	Cells 2, 3, 4, 5, 6, 7	4.7	3.70
1995	Cell 6	Cells 5, 6, 7	11.8	9.20
1995	Cell 7	Cells 2, 3, 4, 5, 6, 7	4.7	3.70
1995	Cell 7	Cells 5, 6, 7	11.8	9.20
1995	Cell 8 (Floor)	NA	0.25	0.20
1995	Cell 8 (Walls)	NA	0.25	0.20
1995	Cell 8	Cells 8, 9, 11	16.8	13.1
1995	Cell 9	Cells 1, 9, 10, 11	8.5	6.65
1995	Cell 9	Cells 8, 9, 11	16.8	13.1
1995	Cell 10	Cells 1, 9, 10, 11	8.5	6.65
1995	Cell 10	NA	11.5	8.96
1995	Cell 11	Cells 1, 9, 10, 11	8.5	6.65
1995	Cell 11	Cells 8, 9, 11	16.8	13.1
1995	Cell 12	Cells 12, 13	9.2	7.21
1995	Cell 13	Cells 12, 13	9.2	7.21
1995	Cell 14a	Cells 14a, 14b, 14c, 15b	7.4	5.76
1995	Cell 14b	Cells 14a, 14b, 14c, 15b	7.4	5.76
1995	Cell 14c	Cells 14a, 14b, 14c, 15b	7.4	5.76
1995	Cell 15a (Floor)	NA	1.4	1.12
1995	Cell 15a (Walls)	NA	3.9	3.04
1995	Cell 15b	Cells 14a, 14b, 14c, 15b	7.4	5.76
1995	Cell 16 (Ashpile)	NA	0.22	0.17
1995	Cell 16	NA	1.4	1.12
1995	Cell 17 (Sinkhole Floor)	NA	0.49	0.38
1995	Cell 17 (Sinkhole Walls)	NA	3.1	2.39
1995	Cell 18 (Railroad) (Floor)	NA	1.0	0.80
1995	Cell 18 (Railroad) (Walls)	NA	11.0	8.56
1995	Cell 18	NA	14.8	11.5
2012	Sample 1	NA	0.42	0.33
2012	Sample 2	NA	2.0	1.60
2012	Sample 3	NA	0.61	0.47
2012	Sample 4	NA	0.43	0.32
2012	Sample 5	NA	0.52	0.39
2012	Sample 6	NA	0.052	0.043

^a For composite cell samples, TEQs are representative of all of the cells in the composite.

Bold/Italics values: Because congener-specific data were not available for the 1995 samples, the WHO 2005 TCDD TEQ values were estimated by multiplying the I-TEF TEQ concentration by a factor of 0.78, the average for the 6 samples collected in 2012 that had full congener-specific PCDD/F profiles.

from the walls and floor of the basin area that is below the plane of the general grade of the surrounding areas in order to avoid sampling any adjacent capped areas.

Figure 12 shows DU #6 (Uncapped Area West), which is the uncapped area of the site between the entrance and the capped area (DU #2). This DU is about 1 acre in area and will be divided into 4 SU of 0.25 acres each. One of the SU covers the area of the former truck decontamination pad where truck tires were washed before material from the site was hauled off-site during the remediation of the Site. Because there might a higher level of heterogeneity in this area, this SU will be sampled using three incremental samples of 30 increments and two of the other three SU will be randomly selected and sampled using one incremental sample of 30 increments.

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Figure 13 identifies DU #7 (Railroad Ditch) corresponding to the railroad ditch area that receives stormwater overflow from the natural berm area of the site during exceptionally heavy rain events. This railroad ditch area is a relatively flat zone immediately downhill from the natural berm area and adjacent to the railroad tracks, with a slight grade eastward towards the railroad tunnel. Sampling over a the span of this ditch area from the natural berm area to the railroad tunnel using the incremental composite sampling approach will evaluate offsite PCDD/F transport that might have occurred. It will also provide insight regarding whether or not the high sample from the natural berm area onsite (1,600 ppt TEQ) can be considered an isolated outlier or a possible source for PCDD/F release. This DU is bound to the south by the bottom of the hillside and to the north by the railroad track ballast. The western boundary for this DU is 20 ft west of the 1,600 ppt TEQ sample and the eastern boundary is 460 ft from the same sample and is the end of the former railroad ditch excavation area. One incremental sample of 30 increments will be collected from this DU.

Table 2. Summary of the Sampling Approach by Decision Unit^a.

Decision Unit Name	Surface Area (acres)	Expected Heterogeneity	Expected Distribution of Increments	Number of Incremental Samples	Number of Increments	Description
DU 1 Uncapped Area East	1.2	Low to Moderate	Lognormal	<u>3</u>	30	<u>DU will be divided into 5 SU of 0.25 acres.</u> <u>3 SU will be randomly selected.</u> <u>1 incremental sample of 30 increments will be collected from each selected SU.</u> <u>Heterogeneity expected to be low to moderate due to the lack of past site activities in this area.</u>
DU 2 Capped Area	11	Low	Normal	<u>10</u>	30	<u>DU will be divided into 44 SU of 0.25 acres.</u> <u>8 SU will be randomly selected.</u> <u>1 incremental sample of 30 increments from 7 SU.</u> <u>3 incremental samples of 30 increments from 1 SU.</u> <u>Heterogeneity expected to be low</u>

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2 SU will be randomly selected.¶
1 incremental sample of 30 increments will be collected from each selected SU.¶
Heterogeneity expected to be low to moderate due to the lack of past site activities in this area.

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							<u>because sampled soil will be from the clean cap.</u>
DU 3 Stormwater Ditch North	0.14	Moderate	Lognormal	2	40		Ditch is divided evenly into 2 SU of approximately 233 m in length. 1 incremental sample of 40 increments to be collected from each SU. Increments will be collected from the bottom of the ditch approximately every 6 m over a combined length of 467 m.
DU 4 Stormwater Ditch South	0.17	Moderate	Lognormal	2	40		Ditch is divided evenly into 2 SU of approximately 280 m in length. 1 incremental sample of 40 increments to be collected from each segment. Increments will be collected from the bottom of the ditch approximately every 7 m over approximate combined length of 560 m.
DU 5 Berm Area	0.02	Moderate	Lognormal	3	30		<u>DU is bounded to the north by the fenceline and to the south by the road.</u> <u>DU boundary to west is 10 ft from 1,600 ppt TEQ sample and boundary to the east is 50 ft from the same sample.</u> <u>3 incremental samples of 30 increments.</u> <u>Entire area between main road and fenceline will be sampled including ditch bottom, sides, and horizontal surfaces in a similar plane as the road.</u>
DU 6 Uncapped Area West	1.0	Low to Moderate	Lognormal	5	30		<u>DU will be divided into 4 SU of 0.25 acres.</u> <u>3 incremental samples of 30 increments from truck decontamination area (area closest to capped area).</u> <u>2 SU of 3 remaining will be randomly selected for 1 incremental sample of 30 increments each.</u>
DU 7 Railroad Ditch	0.06	Low	Lognormal	1	30		DU is bounded to the south by the bottom of the hillside and to the north 5 ft from railroad track ballast. DU boundary to the west is 20 ft from 1,600 ppt TEQ sample and to the east is 460 ft from the same sample to the end of the former railroad ditch excavation area.

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5 SU will be randomly selected.¶
1 incremental sample of 30 increments from 4 SU.¶
3 incremental samples of 30 increments from 1 SU.¶
Heterogeneity expected to be low because sampled soil will be from the clean cap.

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DU boundary to west is 10 ft from 1,600 ppt TEQ sample and boundary to the east is 50 ft from the same sample.¶
1 incremental sample of 30 increments.¶
Entire area between main road and fenceline will be sampled including ditch bottom, sides, and horizontal surfaces in a similar plane as the road.

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1 incremental sample of 30 increments from truck decontamination area (area closest to capped area).¶
1 SU of 3 remaining will be randomly selected for 1 incremental samples of 30 increments .

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^a All samples will be collected from 0-6 inches from the surface.

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Conclusions

The CSM proposed for the Arkwood Site addresses polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/Fs) to evaluate risk assessment compliance of the remediated Site given recent changes in the toxicity criteria for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) . The CSM proposed for the Arkwood Inc. Site is based on historical activities, available analytical data and site conditions. A total of 7 DUs are identified for the Site. These DUs were developed and will be sampled following EPA guidance to confirm PCDD/Fs concentrations. The results for each DU will be used to evaluate risk assessment compliance for PCDD/Fs at the Arkwood, Inc. Site.

After the EPA approves the proposed CSM, a work plan detailing the sampling methods and analytical procedures will be prepared and submitted for agency approval.

Signed,

Brent D. Kerger, Ph.D., DABT
Senior Principal Health Scientist

Dennis J. Paustenbach, Ph.D., CIH, DABT
President and Managing Principal

References

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